Watertown Arsenal,
Building 312
Arsenal Street
Watertown
Middlesex County
Massachusetts

HAER No. MA-20-F

HAER
MASS,
9-WATO,
5F-

PHOTOGRAPHS

Historic American Engineering Record
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HAER MASS 9-WATO, 5F-

HISTORIC AMERICAN ENGINEERING RECORD

Addendum to:
WATERTOWN ARSENAL, Building No. 312
(Gun Carriage Erecting Shop)

HAER NO. MA-20-F

191 pages of overview narrative documentation for HAER No. MA-20 and three photographs for HAER No. MA-20-F were previously transmitted to the Library of Congress.

Location: Wooley Avenue, Watertown, Middlesex County, Massachusetts.

UTM: 19.321700.4692080
USGS QUAD: Newton, Massachusetts

Engineer/Architect: Unknown.

Date of Construction: 1894; west additions ca. 1917 and 1941; substantial renovations 1961-62.

Present Owner: U.S. Army Materials Technology Laboratories (AMTL)
Arsenal Street
Watertown, Massachusetts 02172

Present Use: Building No. 312 serves as a metals and ceramics laboratory, including: a plating shop, Be and DU machining, crystal growth laboratory, a mechanical equipment loft, e shock wave physics laboratory, laser lab, gas-propelled ballistic ranges, and offices.

Significance: Building No. 312, constructed to facilitate the erection of gun carriages, is significant for its industrial assocation with three adjacent buildings to the west, south, and north (312, HAER No. MA-20-F; 37, HAER No. MA-20-D; and 43, HAER No. MA-20-C), with which it formed a tightly functioning gun carriage manufacturing complex by the end of the nineteenth century. Its design features reflect its function and illustrate the precursor style to the subsequent Erecting Shop built in 1917 (311, HAER No. MA-20-E) at Watertown Arsenal.

Project Information: This documentation wes undertaken in accordance with Section 106 of the Nationel Historic Preservation Act of 1966, as amended, prior to base realignment end closure.

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I. ARCHITECTURAL DESCRIPTION AND MODIFICATIONS

Building No. 312, also known historically as the gun carriaga Eracting Shop, is locatad in an industrial satting at tha southwest saction of the Watertown Arsanal gun carriage manufacturing complex near the canter of the present-day AMTL property. It is surroundad by Thornton Avenua Avenua (east), Kingsbury Avanue (south and wast), snd Wooley Avanue (north). Adjacent landuse includes asphalt-paved roads and industrial buildings to the west, north, and eaat, and a parking lot to the south. Landscaping is confinad to a grass sidawalk strip on tha east sida of the building.

Erectad in 1B94 spacifically to provida a largar snd battar suitad fscility for arecting and assambling gun carriagas, Building No. 312's siting and oriantation was functionally linked to tha axiating gun carriaga manufacturing complex buildings. It sits perpendicular to and diractly wast of Building No. 37 (the Foundry; HAER No. MA-20-D) and Building No. 313 (the Machine Shop; HAER No. MA-20-G), and southwest of Building No. 43 (the Smith Shop; HAER No. MA-20-C). Alterations ainca its original construction consist primarily of two similar, aarly-twantiath-century additions to the wast alavation, and, in 1961-62, s serias of interior changes, and the raplacement of windows and doors associatad with changea in use. Overall, howevar, Building No. 312 retains its late-nineteanth-cantury industrial architactural charactar and its sensa of ralationship to associated buildinga.

Building No. 312 is as a ractangular, brick structura, 2B0 ft. long by B0 ft. wide, with a gable roof running north-south and a one-story west additlon. Tha main building has 24 bays along aach side, fiva bays on tha north end alevation, and six bays on the south end elevation. It was constructed as a high-bay, ona-story structure; the south section of the interior haa baen rabuilt as two storias (daaribad balow). The building rises from a rock-faced grsnita foundation with walls of common bond-laid load-bearing brick pilaster construction that tarminate above tha brick spandrals in a brick stringcourse and dentil cornica. Structural bay sizas vary betwaen 11 and 17 ft., with 11 ft. being typical. Each of tha gabla ends is padimentad and has sandstone weatherings on the pilaatars. Tha building retains ita original roof, a cambered riveted steel Fink trusa sheathed in slata over wood dacking.

Tha sagmental-arch window opanings, with sandstone lug sills, are aat in racessed brick curtain wells batwaan the load-bearing pilastera. Tha typical windows originally conaisted of two sets of twanty-over-twanty, double-hung wood sash, one diractly sbova the other, to provide maximum light for intricate gun carriege aasembly tasks. Each gable padiment contained a pair of double-hung sash, round-arch windows with a round-srch upper sash. In 196B, sll windows wera removed and replaced with white atuccoad cemant panel infill, some of which have axplosion-proof, small, fixed commercial stael windowa. Tha north gable padiment windows ara infilled; the aouth end's were rabuilt es rectangular vant openings. One ramaining saction of original window saah ls located on the weat elevation betwean the north high-bay part of the main building and tha 1941 wast lean-to addition.

The original primary doorways consistad of at laast fiva wide, segmental-arch opanings. Three wera located on the east elevation and corresponded with similar openings in Buildings No. 37 and 313; one was on tha north elevation with convanient accass to Building No. 43; and one was naar the cantar of the west alevation. Railroad tracks linked Building No. 312 from thase openings to the other gun carriaga manufacturing complax buildings. The wood doora were constructed of psnals snd multiple window lights. The west alavation doorway was eliminatad with the conatructlon of the lean-to sddition in 1941, snd the aouthern doorway on the east elavation has been closed in and rabuilt as a window bay. The remaining doors have baen removed and replaced with rolling steal shutter doors.

A double glass atreet entrance was added to the center window bay of the aouth elevation, and a small entrance was added to tha bay weat of centar on the north elevation.

The weat one-story, shed-roof lean-to additions were added in about 1917 (north section) and 1941 (south aection). The design and materiela of the additions are compatible with the original structure, and aimiler dimensiona, fenestration, and a continuous brick dentil cornice blend the two sections. The riveted steel truaa roof is sheathed in continuous membrane rubber, which repleced the original corrugated cement-esbeatoa covering about 1988.

At its construction, the interior of Building No. 312 contained a aingle high-bay space designad for the erection of the larger gun carriages being built by the end of the nineteenth century. Its axact layout ia not known, but later photographs and plans indicate it contained erecting pita, platens, and heavy machinery arranged along the rail tracks that communicated with adjacent buildinga. It waa equipped with e box girder crene runway for a 100-ton crane in 1912. In 1917, whan Building No. 311, the new Erecting Shop, was constructed, Building No. 312 was converted for use as a heavy machine tool shop. Among the equipment installed ware a 27-1/2-ton Shaw crane, and an immense gear cutter. The first west addition was conatructed as a storage area and tool room at that time. The atorage area was increased in 1941. In 1961-1962 the southern half of the building was reconfigured as two storiea for a beryllium-uranium research laboratory. The conatruction of thia modification is a concrete slab and ateel system, tied into the crane girder and two new internal rows of ateel columns. A concrete block wall divides the north and south halvea of the building. The first floor containa the lebs, with concrete block walla, acoustical tile ceilinga and vinyl tile floor. The second floor contains offices, finiahed with wira lathe and plester walls, acouatical tile ceilinga, and vinyl tile floora. The attic story houaes eir filtering equipment. In the aarly 1970s, plating shop functiona wera installed in the aouth end of the weat lean-to. The north, remaining high-bay half of tha main building now containa several freeatanding crystals and balliatica laboratory atructures. With the exception of the railcrane, which is no longer used, all machine tools have been removed.

Information on the early mechanical ayatems and aubaequent changea ia not easily accesaible. As best aa is known, the building was likely heated by ateam radiator ayatem tied to the main power plant. Water waa supplied through the Arsenal underground pipe system, which by the 1890s waa fed from the town aystem. Electricity waa moat likely installed about 1917 when it waa converted for uae as a machine shop.

II. HISTORICAL INFORMATION AND SIGNIFICANCE

Watertown Arsenal was eatabliahed in 1816 principally aa a depot for the atorage, repair, and isaua of small arma, ordnanca, and supplies for the U.S. Army, and, secondarily, for the manufacture of amall arms cartridgas. The original construction consisted of a regularly arranged quadrangle of similer brick buildings located eest of the present-day AMTL property. By the 1840a, the construction of wooden field, siege, and seacoast gun carriages and their limbers and caissona, along with work in metallurgy and tha development of cast iron guns, had begun. While the military continued to rely on private foundries for much ordnance work, and gun carriage manufacturing waa an auxiliary reaponsibility to Watertown Araenal'a main ordnance atorege, meintenance, and distribution taaks, neverthelesa the Industrial activitiea came to hava greater Importance through the nineteenth century.

In the nineteenth century, field carriages and their limbers (detachable, wheeled, front sectione for field mobility) end caissons (ammunition wagons), were constructed of oek timbers with wrought iron reinforcement and were relatively smell and eimply designed. Seacoaet carriages, by contrest, needed to be larger and more complex to accomodate the more massive guns, which were pivot mounted on stationery beses. Cerrieges were constructed of cast iron, wood, wrought iron, and, at the end of the nineteenth century, eteel. In all ceses, carriage assembly consisted of numerous perts that were individually fabricated end not interchangeable. While the meterials end methods of production of gun cerriages chenged, manufacturing et the Wetertown Arsenal has always been characterized by smell quantity and variety of products, assembled from meny specialized parts, rather then large scale mass production.

The construction in 1847 of the East Timber Store House, in 1851 of the West Timber Storehouse (Building No. 37; HAER No. MA-20-D), in 1862 of a Carriage and Machine Shop (Building No. 313; HAER No. MA-20-G) and Forge/Smith Shop (Building No. 43; HAER No. MA-20-C), eetablished the early core of the gun carriage manufacturing complex and industrial operations at Wetertown Arsenal. The four buildinge of the gun carriage manufecturing complex provided an integreted locus of production where rew wood from the storehouses and wrought iron processed in the forge were fashioned into perts and assembled in the Carriege end Mechine Shop.

In the 1880s, e new national seecoast defense program was established which included provisions to enhance fortificetions and update armaments. New cerriage designa for field end seige breechloeding steel guns, as well es the fabrication of berbette and dieappearing carrieges for 6-Inch to 16-inch eeacoast guns, wes initiated. In 1891, in response to the production needs for these lerger, predominently steel carrieges, the Department of Wer selected Watertown Arsenel as the Army's gun carriage manufacturing plant, a counterpert to the Army gun factory et Watervliet Arsenal, New York (designated in 1887). Appropriations from Congress for thie new mission ellowed e significant expansion and improvement of Watertown Arsenal in the 1890e. Completed in 1894, Building No. 312 joined the existing gun carriege manufacturing complex buildings to provide additional space for gun carriage erection. It wes the only new building conetructed es pert of thie series of major improvements to the Watertown Arsenal gun carriage manufacturing complex.

Built es en Erectlng Shop for gun carrieges at a cost of $35,000, Building No. 312 repleced the previoue erecting area thet hed been set up in the south wing of Building No. 313 with a much larger epace. Its lerge, rectangular shape and two-etory height with gable roof were designed to eccomodate the lerger, new model, diseppearing, steel gun cerriegee being constructed et the end of the nlneteenth century. The full-height windows provided maximum light. Building No. 312's siting was arranged to functionally correspond to the exieting gun cerriege manufacturing complex buildings, where production processes took place. The buildings were linked by standard geuge reil, which aleo connected to the main track of the Fitchburg line if the Boston & Maine railroed north of the Areenal. The design of the building was traneitional in thet it used brick bearing pilasters which permitted the installation of full height windows, yet overall reteined the treditional look cherecteristic of earlier Watertown Arsenal buildinge.[1]

The Erecting Shop eat at a right angle to and weet of the foundry that had been newly installed in Bullding No. 37 and the Mechine Shop, located in Building No. 313. Parts fabricated in the metal-working shopa in thoae buildings were tranaferred to the south end central sectione of Building No. 312 for assembly into gun carrieges. Arched openings in Building No. 312 were placed to correepond with

thosa in adjacant buildings in order to facilitate tranafer of parts and materiala. The north end of the Eracting Shop was used for storing completed carriagas.

Tha Arsanal production of the naw model disappearing gun carriaga designs incraasad staadily in tha dacadaa following this expanslon. In 1900, construction of Building No. 36, tha Gun Carriaga Storahousa, used for storaga of parts and finished carriages, and axpanded about 1912, parmittad full usa of Building No. 312 for carriaga assembly. It fullfilled thia naad until tha baginning of World War I. During World War I, the production capacity of Watertown Arsenal was substantially axpanded and tha Araenal nearly tripled in size. Its primary output was the manufacture of gun carriages for 16-in. seacoaat guns, although smallar gun carriages, armor-piercing projectiles, and othar ordnance aupplies wara also produced. In 1917, with the complation of a naw, immense Eracting Shop to the northwest, Building No. 311 (HAER No. MA-20-E), Building No. 312 wea convertad to a large heavy Machine Tool Shop aupporting saacoast gun carriaga production. Among the aquipmant installad was ona of tha largast gaar cuttars in tha world. It was usad to machina tha 32-ft. diameter, circular travarsing racks, ona half of which (180-dagree section) was usad on the carriage of each 16-in. gun. Tha shop operatad 24 hours a day for eight days to complete the ahaping of tha 576 teeth on each full rack. Building No. 312 continued to function in this machina ahop capacity through tha interwar and World War II pariods.[2] Among tha oldast aquipmant locatad in Building No. 312 just prior to World War II were a 48-year-old Putnam latha used on the top carriage of tha 3-in. anti-aircraft gun and on cylindera for the 16-in. gun; a 46-year-old Niles vertical boring mill for machining 8-in. cradles and similar work; and e 45-year-old Pond planer used to machine angles and brackets on the 16-in. gun shiald. A Univaraal boring mill was the only modern machina in the building at that tima.[3]

The most recant phasa of davalopment of Building No. 312 reflecta Watartown Arsanal's ahift from manufacturing to materials reseerch and testing aftar World War II. In 1961 to 1962, following Watertown Arsenel'a succasses in axperimentation with titanium, Building No. 312 waa refitted as tha Arsenal canter for testing and machining tha rara matals beryllium and uranium for naw applications. Tha windows wara raplacad, and laboratory facilitias wara constructad in tha south half of tha building. With tha closura of tha hiatoric Watartown Arsanal in 1967, and tha establishment of the Army Matarials and Machanics Research Centar, now AMTL, Building No. 312 has continued its laboratory functions.

III. ENDNOTES

1. Burna and Bahr, 46-47. This documant comprises the 191 data pagea previously submittad to tha Library of Congreas for the Watertown Arsenal, HAER No. MA-20. Dobbs, 37.

2. Dobba, 37.

3. "Tha Arsenala in Action."

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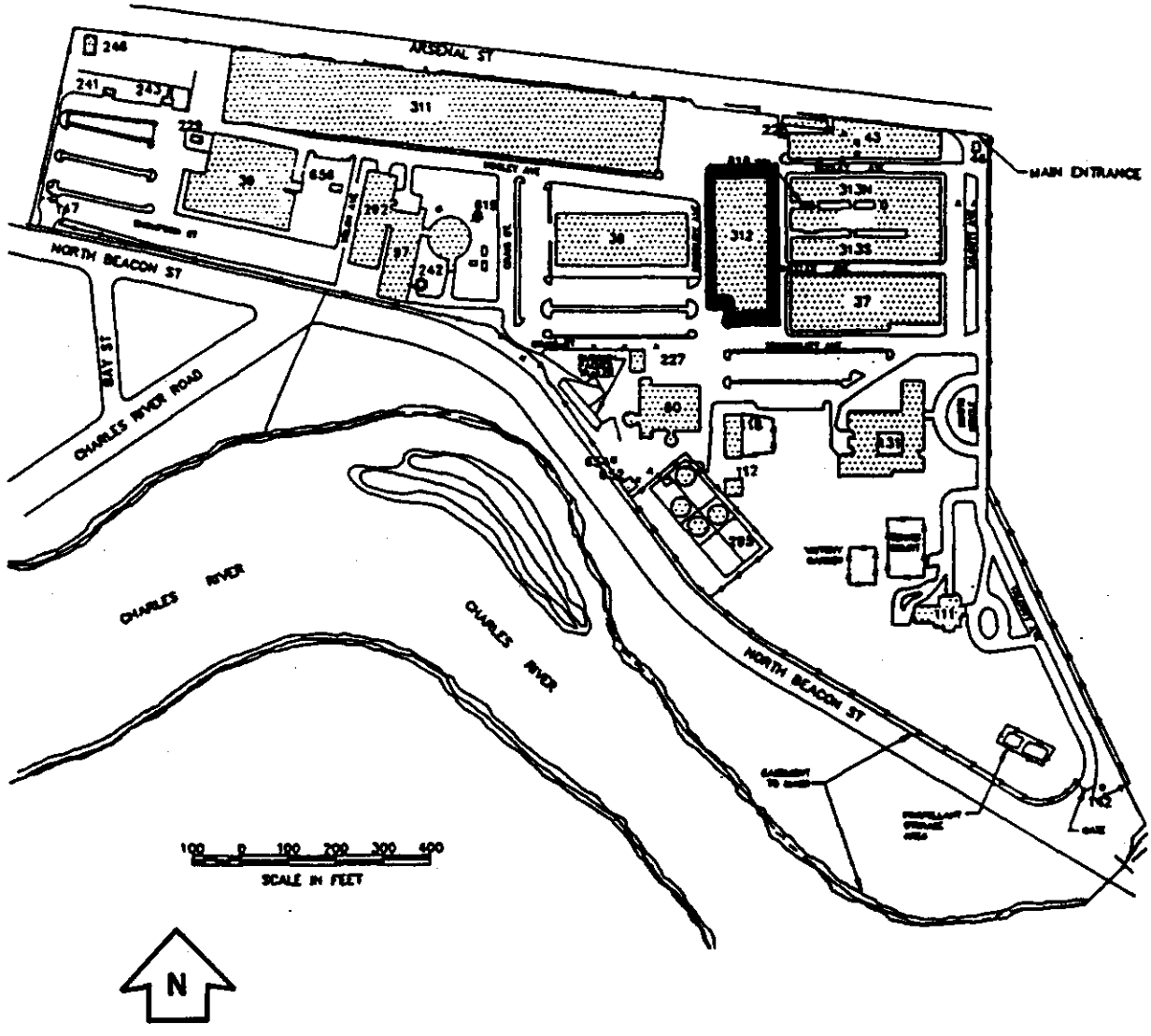
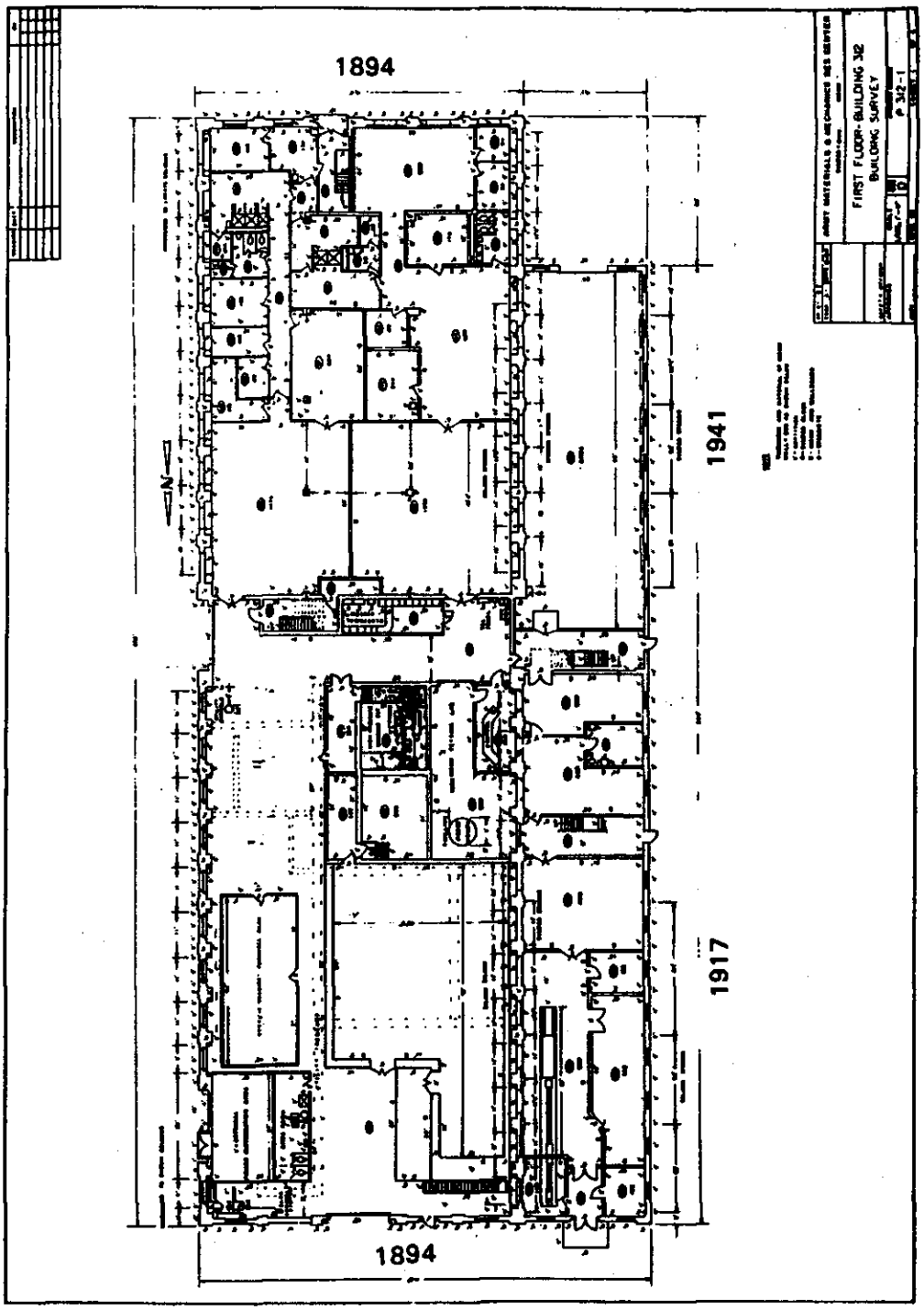
For further sources, consult Burne and Bahr, 1982, previously submitted to the Library of Congress as HABS/HAER documentation for Wetertown Arsenal, HAER No. MA-20.

LOCATION MAP WITHIN WATERTOWN ARSENAL



Source: E. G. & G., USATHAMA report, 1988.

1984 AMMRC BUILDING SURVEY FLOOR PLAN



Source: Engineering Division, AMTL, Watertown, 1984.